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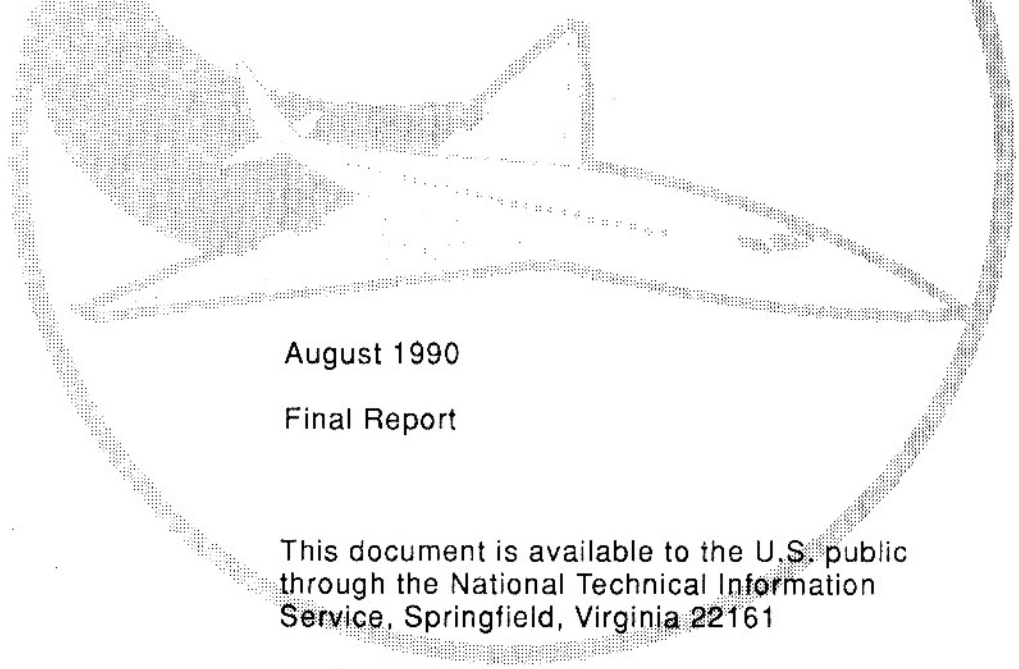
Simulation of Quadruple Simultaneous Parallel ILS Approaches at D/FW - Phase III

Test Report



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16. Abstract

This study was part of an ongoing effort to evaluate plans for increasing air traffic capacity in the Dallas/Fort Worth (D/FW) area. The objective was to evaluate the traffic handling ability of controllers during Instrument Meteorological Conditions (IMC) for D/FW's proposed quadruple parallel approach airport configuration using a real-time air traffic control (ATC) simulation.

Both dual and quadruple simultaneous parallel Instrument Landing System (ILS) approaches were simulated with controllers monitoring approach traffic. Blunders were introduced by having simulated aircraft deviate toward adjacent localizers. Some of the blundering aircraft also simulated a loss of radio communication. The ability of the controllers to maintain distance between blundering aircraft and aircraft on parallel approaches was the central issue in the study. Additionally, a few runs evaluated the missed approach procedures with the controllers monitoring the departing and missed approach aircraft.

Based upon the findings of the simulation, it was concluded that the quadruple simultaneous parallel ILS approach procedures are safe and workable for the airport configuration (D/FW) tested. Therefore, the operations at D/FW were recommended.

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EXECUTIVE SUMMARY

This study was part of an ongoing effort to evaluate plans for increasing air traffic capacity in the Dallas/Fort Worth (D/FW) area and to evaluate multiple parallel approaches in general. The objective of this study was to evaluate the traffic handling ability of controllers during Instrument Meteorological Conditions (IMC) for D/FW's proposed quadruple parallel runway airport configuration using a real-time air traffic control (ATC) simulation. The proposed changes to the existing D/FW airport configuration included the addition of two additional runways parallel to the four existing runways. Runway 16L was 8500 feet (ft) long located 5000 ft east of 17L with the threshold offset to the south. Runway 16R was 9900 ft long located 5800 ft west of 18R with the threshold offset to the north. Runways 17L and 18R are 11,388 ft long and are spaced 8800 ft apart.

Both dual and quadruple simultaneous parallel Instrument Landing System (ILS) approaches were simulated with controllers monitoring traffic on the approach localizers. Blunders were introduced, according to predetermined scenarios, by having simulated aircraft deviate off the localizer at 10, 20, or 30 degree angles. Some of the blundering aircraft also simulated loss of radio communication with the controllers. The ability of the controllers to maintain distance between blundering aircraft and aircraft on parallel approaches was the central issue in the study. Additionally, a few runs evaluated the missed approach procedures with the controllers monitoring the departing and missed approach aircraft. Missed approaches were initiated to evaluate the controller's ability to maintain distance between missed approach aircraft and departing aircraft. Four questions were to be answered:

1. Can the controllers maintain miss distances of greater than 500 ft between aircraft, in response to blunders, for the proposed approach configuration?

2. Are there statistical differences between the miss distances achieved in the dual and quadruple operations? If so, are the differences operationally significant?

3. In the event of a missed approach, can the controllers maintain miss distances of greater than 500 ft between departing aircraft and the missed approach aircraft for the proposed airport configuration?

4. Do the controllers, controller observers, and ATC management observers view the quadruple approach operation as acceptable, achievable, and safe?

All of the blunders in both the dual and quadruple approach operations resulted in slant range miss distances that were greater than 900 ft. While manning the departure monitor positions,

controllers maintained a minimum miss distance of 3765 ft between missed approach aircraft and other aircraft. These values were both greater than the 500 ft test criterion used in the simulation.

Analysis of the CPA and the API metrics indicated that the quadruple approach operation resulted in miss distances that were statistically less than the miss distances that occurred in the dual approach operation. The miss distances between the aircraft in the quadruple approach operation were generally large (average miss distance = 7763 ft). The difference between the average miss distances for dual and quadruple approaches was small (1216 ft) relative to the average miss distance, therefore, it was determined that there were no operational differences between the dual and quadruple approach conditions.

The controllers who participated in the simulation found the quadruple approach operation to be a "safe, efficient, and workable procedure."

The Multiple Parallel Technical Work Group (TWG), composed of air traffic control, flight safety, flight standards, and operations personnel, participated in the simulation and evaluated the simulation findings. Based upon the TWG's understanding of (1) daily operations, (2) the knowledge and skills of controllers, and (3) the contingencies which must be accounted for, the TWG found the quadruple approaches, simulated for D/FW, as acceptable, achievable, and safe.

Based upon the findings of the statistical analysis, the Administrative Assessment, the Controllers Report, and the Industry Observer comments, it was concluded that the quadruple simultaneous parallel ILS approach procedures are safe and workable for the airport configuration (D/FW) tested in this simulation. Therefore, the TWG recommended the implementation of quadruple simultaneous parallel ILS approach operations at D/FW. The TWG further recommends:

1. There shall be one monitor controller for each runway. Personnel and equipment shall be provided to support the procedure.

2. All monitor positions should be located together and near their respective arrival and departure positions.

3. Radar coverage must be provided through the missed approach point to a point 7 nautical miles (nmi) beyond the departure end of the runway. Coverage shall be as low as 50 ft above the runway surface or as approved by flight standards. Approach minimums will be dependent upon the lowest point at which radar coverage can be provided, e.g., CAT II minimums if radar coverage can be accomplished as low as 50 ft above the runway surface, etc.

4. The No Transgression Zone (NTZ) needs to be extended through the missed approach to a point 7 nmi beyond the departure end of the runways.

5. The Implementation Strategy used prior to conducting quadruple approaches to the lowest authorized minimum for D/FW shall include a phase-in period, 60 days or 1000 approaches, with a minimum visibility of 1500 ft/3 nmi.